RESULTS OF STUDYING THE HEMAGGLUTINATION INHIBITION AND ANTIBODY NEUTRALIZATION REACTION IN THE PRACTICE OF EPIZOOTOLOGICAL INVESTIGATIONS OF PLAGUE IN WILD RODENTS

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[Following is the translation of an article by M.I. Levy, Yu. G. Suchkov, et al, in the Russian-language journal Zhurnal Mikrobiologii, epidemiologii i immunobiologii (Journal of Microbiology, Epidemiology and Immunobiology), No 12, 1963, pages 118-119.]

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The hemagglutination-inhibition reaction is the most sensitive serological method of detecting antibodies to plague causative agents. In order to reveal the specific antigen of plague bacillus the antibody neutralization reaction has been successfully used, which is more sensitive than other serological methods. Accordingly, we employed these reactions in experimentation and in epizoological examination of rodents in natural foci of plague.

Formalinized sheep and chicken erythrocytes sensitized with fractional I of plague bacillus were used in the reaction. This diagnosticum (160 series) was prepared at the Rostov Antiplague Institute. Different series retained their activity for 4-20 months. The standard antiplague agglutinating serum in a dilution 1:400,000-1:600,000 agglutinated sensitized erythrocytes. Since fraction I is the antigen belonging only to the plague bacillus, account need be taken in carrying out the hemagglutination-inhibition reaction of antibodies to plague causative without fear of confusing them with antibodies of some other causative agent. To confirm the specificity of the reaction results in several cases use was made of the hemagglutination-inhibition reaction.

In all, 3,097 animals were infected with plague and investigated in the experiment (491 small marmots, 2,044 Pallasiomys meridianus of the Volga-Ural sands, 83 Pallasiomys meridianus of the right bank of the Volga, 350 large jerboa, 86 common voles, 13 grey marmot badgers, and 30 tamaris-

kovyye jerboa). It was established that in species of rodents relatively resistant to plague bacillus antibodies resulting from experimental infection were often found (up to 100%) and in relatively high titers (up to 1:80,000), while in highly sensitive species of animals antibodies were detected infrequently and at low titers (1:40-1:60); antibodies appeared at the end of the first week following infection; the antibody titer of nonhibernating rodents (large and Pallasiomys meridianus jerboa) reached a maximum by the third-fourth week, at which point antibodies were detected in most cases during the course of 2-5 months from the moment of infection; antibodies were detected in hibernating rodents (small jerboa and grey marmot) during a longer time, which is evidently due to the hibernation.

During 1959-1962 serological examination of wild rodents (upwards ot 27,000 animals) were carried out in the Volga-Ural, Central Asiatic desert and mountainous natural plague foci and in the focus of the Northwest Caspian area. Sera chiefly of those animals which serve as the principal hosts of infection were investigated in the hemagglutination-inhibition reaction. Investigations carried out in different parts of the Central Asiatic plague foci revealed that the number of seropositive rodents as a rule considerably surpassed the number of animals from which the causative agent of the infection was isolated. At places where at the time of the examination or not long before acute plague epizootic had occurred, the number of rodents which contained antibodies amounted to 60-100 percent. Establishing plague epizootic by using the bacteriological method was considerably more difficult and often hundreds and thousands of investigated rodents were necessary to obtain one isolated culture.

[In contrast], by means of the neutralization reaction antibodies could be investigated for plague in 2-3 hours, in decaying and dessicating carcasses of animals collected in the steppe. Upon negative bacteriological examination the specific antibodies were found in the mummified carcass of a large jerboa, in bone remains and organs of intensely decayed carcasses from the areas of epizootic. The results of the reaction were always positive in investigating biopsied animals (white mice) succumbing to the plague.

In this way the investigations confirmed the promise and usefulness of using the hemagglutination-inhibition and antibody neutralization reaction in epizootological examinations for plague. Several years of broad use of these reactions can prove sufficient for an approximate estimation of the enzootic territory, while the use of the bacteriological method alone for this territory will sometimes take tens of years.